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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/605,478	10/02/2003	Hsiu-Chuan Chu	12157-US-PA-X	2477

31561 7590 11/24/2004

JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE
7 FLOOR-1, NO. 100
ROOSEVELT ROAD, SECTION 2
TAIPEI, 100
TAIWAN

EXAMINER	
WILSON, CHRISTIAN D	

ART UNIT	PAPER NUMBER
2824	

DATE MAILED: 11/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/605,478	CHU ET AL.	
	Examiner	Art Unit	
	Christian Wilson	2824	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-20 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 02 October 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 10022003.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☒ Other: search history.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: in various places in the specification, the units of length are listed as "□m" which should be "μm". The title includes brackets which should be removed.

Appropriate correction is required.

Claim Objections

2. Claims 12 and 18 are objected to because of the following informalities: these claims list length units of "□m" which should be "μm". Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1 – 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bayman *et al.* in view of Gondhalekar *et al.*

Bayman *et al.* (US 6,596,654) teaches a method of silicon oxide gap filling comprising the steps of providing a substrate with a trench [Figure 2A] with an aspect ratio of 3.5, performing a CVD process with an etching effect to fill the trench with silicon oxide [column 1,

lines 55-65], where the reaction gases comprise He/H_2 as a sputtering-etching gas in a percentage of 70% [column 4, lines 20-50]. Bayman *et al.* does not discuss a trench with an aspect ratio of 4.0 or greater. Gondhalekar *et al.* (US 2004/0126952) teaches a CVD method for filling a trench with an aspect ratio of 4.0 or greater [0005]. It would have been obvious to one of ordinary skill in the art to use the method of Bayman *et al.* to fill the high aspect ratio of Gondhalekar *et al.* since Gondhalekar *et al.* teaches that the CVD method of Bayman *et al.* provides an improved gapfill for high aspect ratio trenches.

Regarding claim 2, Bayman *et al.* further teaches an HDP-CVD method [column 3, line 60].

Regarding claim 3, Bayman *et al.* further teaches a ratio of He to H_2 of 0.3 – 4.0 [Figure 1A].

Regarding claim 4, Bayman *et al.* further teaches an ED ratio of 0.14 [column 4, lines 10-15]. Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). It would have been obvious to one of ordinary skill in the art to use the ED ratio of 0.1 – 0.03 in the method of Bayman *et al.* since the normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages.

Regarding claim 5, Bayman *et al.* further teaches deposition gases of SiH_4 and O_2 [column 2, lines 49 and 60].

Regarding claim 6, Bayman *et al.* further teaches the claimed deposition parameters [column 8, lines 40 and 55; column 7, lines 45-50]. Bayman *et al.* teaches a He flow rate of 180 sccm. Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). It would have been obvious to one of ordinary skill in the art to use the flow rate of 200 sccm in the method of Bayman *et al.* since the normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages.

Regarding claim 7, Bayman *et al.* further teaches an STI process in a 130 nm semiconductor method [column 12, line 25]. Gondhalekar *et al.* teaches a CVD method for filling a trench in a 90 nm semiconductor process [0005]. It would have been obvious to one of ordinary skill in the art to use the method of Bayman *et al.* in the 90 nm method of Gondhalekar *et al.* since Gondhalekar *et al.* teaches that the CVD method of Bayman *et al.* provides an improved gapfill for small widths.

5. Claims 8 – 11 and 13 – 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bayman *et al.*

Regarding claim 8, Bayman *et al.* teaches a method of silicon oxide gap filling comprising the steps of providing a substrate with a trench [Figure 2A], performing a CVD process with an etching effect to fill the trench with silicon oxide [column 1, lines 55-65], where the reaction gases comprise He/H_2 as a sputtering-etching gas [column 4, lines 20-50]. Bayman *et al.* does not explicitly teach the increase in the percentage of He/H_2 to fill higher aspect ratio trenches. It would have been obvious to one of ordinary skill in the art to increase the percentage of He/H_2 to fill higher aspect ratio trenches since Bayman *et al.* does teach filling structures with a higher aspect ratio [column 9, lines 35-40] and teaches the effectiveness of altering the He/H_2 percentage when filling high aspect ratio trenches [column 4, lines 25-35].

Regarding claim 9, Bayman *et al.* further teaches an HDP-CVD method [column 3, line 60].

Regarding claim 10, Bayman *et al.* further teaches an STI process [column 12, line 25].

Regarding claim 11, Regarding claim 3, Bayman *et al.* further teaches a ratio of He to H_2 of 0.3 – 4.0 [Figure 1A].

Regarding claim 13, Bayman *et al.* further teaches an ED ratio of 0.14 [column 4, lines 10-15]. Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). It would have been obvious to one of ordinary skill in the art to use the ED ratio of 0.1 – 0.03 in the method of Bayman *et al.* since the normal desire of scientists or artisans to improve upon what is

already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages.

Regarding claim 14, Bayman *et al.* further teaches deposition gases of SiH_4 and O_2 [column 2, lines 49 and 60].

Regarding claim 15, Bayman *et al.* further teaches the claimed deposition parameters [column 8, lines 40 and 55; column 7, lines 45-50]. Bayman *et al.* teaches a He flow rate of 180 sccm. Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). It would have been obvious to one of ordinary skill in the art to use the flow rate of 200 sccm in the method of Bayman *et al.* since the normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages.

Regarding claim 16, Bayman *et al.* teaches a method of silicon oxide gap filling comprising the steps of providing a substrate with a trench [Figure 2A], performing a HDP-CVD method [column 3, line 60] process with an etching effect to fill the trench with silicon oxide [column 1, lines 55-65] with the claimed deposition parameters [column 8, lines 40 and 55; column 7, lines 45-50] and an ED ratio of 0.14 [column 4, lines 10-15], where the reaction gases comprise He/H_2 as a sputtering-etching gas [column 4, lines 20-50]. Bayman *et al.* teaches a He flow rate of 180 sccm, but does not explicitly teach the increase in the percentage of He/H_2 to fill

higher aspect ratio trenches. Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). It would have been obvious to one of ordinary skill in the art to increase the percentage of He/H_2 to fill higher aspect ratio trenches since Bayman *et al.* does teach filling structures with a higher aspect ratio [column 9, lines 35-40] and teaches the effectiveness of altering the He/H_2 percentage when filling high aspect ratio trenches [column 4, lines 25-35]. Further, the ED ratio and He flow rate would have been obvious to one of ordinary skill in the art since the normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages.

Regarding claim 17, Bayman *et al.* further teaches a ratio of He to H_2 of 0.3 – 4.0 [Figure 1A].

6. Claims 12 and 18 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bayman *et al.* as applied to claims 11 and 17 above, and further in view of Gondhalekar *et al.*

Regarding claims 12 and 18, Bayman *et al.* further teaches an CVD process in a 130 nm semiconductor method [column 12, line 25]. Gondhalekar *et al.* teaches a CVD method for filling a trench in a 90 nm semiconductor process [0005]. It would have been obvious to one of ordinary skill in the art to use the method of Bayman *et al.* in the 90 nm method of Gondhalekar

et al. since Gondhalekar *et al.* teaches that the CVD method of Bayman *et al.* provides an improved gapfill for small widths.

Regarding claim 19, Bayman *et al.* further teaches the reaction gases comprise He/H_2 as a sputtering-etching gas in a percentage of 70% [column 4, lines 20-50]. Bayman *et al.* does not discuss a trench with an aspect ratio of 4.0 or greater. Gondhalekar *et al.* (US 2004/0126952) teaches a CVD method for filling a trench with an aspect ratio of 4.0 or greater [0005]. It would have been obvious to one of ordinary skill in the art to use the method of Bayman *et al.* to fill the high aspect ratio of Gondhalekar *et al.* since Gondhalekar *et al.* teaches that the CVD method of Bayman *et al.* provides an improved gapfill for high aspect ratio trenches.

Regarding claim 20, Bayman *et al.* further teaches an STI process in a 130 nm semiconductor method [column 12, line 25]. Gondhalekar *et al.* teaches a CVD method for filling a trench in a 90 nm semiconductor process [0005]. It would have been obvious to one of ordinary skill in the art to use the method of Bayman *et al.* in the 90 nm method of Gondhalekar *et al.* since Gondhalekar *et al.* teaches that the CVD method of Bayman *et al.* provides an improved gapfill for small widths.

Conclusion

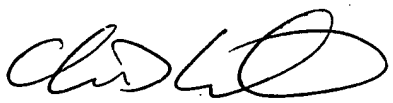
7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited prior art teaches methods of HDP-CVD deposition.

8. A copy of the search history (EAST and STN) is enclosed.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christian Wilson whose telephone number is (571) 272-1886. The examiner can normally be reached on weekdays, 7:30 AM to 4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on (571) 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Christian Wilson, Ph.D.
Primary Examiner
Art Unit 2824

CDW